EXECUTIVE SUMMARY

In early 2002, the Canadian Institutes of Health Research, Institute of Population and Public Health (CIHR-IPPH), with the advice of a multi-agency working group, embarked on a review of the literature to examine the issues and barriers related to Canadian population and public health (PPH) knowledge generation, dissemination and exchange, and uptake. The literature review was complemented by interviews with more than 30 Canadian, American, and United Kingdom organizations that are active in PPH research, especially synthesis research. Research organizations were asked about the mechanisms they use to support PPH research generation, synthesis, transfer, and exchange, as well as their impressions of the need for new Canadian organizational structures to encourage a more integrated approach to these tasks, including challenges to be addressed.

This research project complements and builds on previous work of the CIHR-IPPH* (in partnership with the Canadian Institute for Health Information, Canadian Population Health Initiative (CIHI-CPHI)), which consulted PPH researchers, practitioners, and policy-makers to identify research and knowledge transfer and exchange priorities in population and public health. During these consultation sessions, a number of challenges and opportunities were raised in relation to the synthesis, exchange and transfer of the knowledge acquired through research initiatives. Participants identified three priorities for action: 1) research on the factors contributing to effective knowledge transfer by policy-makers and practitioners; 2) effective ways of communicating PPH knowledge to key stakeholder groups and the public, including effective and innovative use of various media and accessible language for different audiences; and 3) greater investment in knowledge synthesis, diffusion and transfer initiatives, such as the development of high-quality synthesis and meta-analysis on population and public health interventions.

The current project was undertaken in response to these identified gaps in the existence of, access to, and uptake of easily usable, high-quality, practice-relevant PPH research evidence. Specifically, these investigations revealed a number of critical issues around the incorporation of PPH research evidence into policy and program planning:

- Issues of the Evidence Base† – beyond a lack of primary research in the PPH field, there are issues of evidence synthesis:
  - identification of Canadian research and synthesis priorities, including more congruence between the needs of research users and the research questions that are investigated and evidence that is produced,
  - coordination and enhanced efficiency of a Canadian PPH research agenda,

† Evidence base includes both primary PPH research, including evaluations of the effectiveness and efficiency of PPH interventions, and syntheses of this evidence.

Lori Kiefer, MD, MHSc, CCFP, FRCPC
John Frank, MD, CCFP, MSc, FRCPC
Erica Di Ruggiero, MHSc, RD
Maureen Dobbins, PhD, RN
Doug Manuel, MD, MSc, FRCPC
Paul R. Gully, MB, ChB, FRCPC
David Mowat, MBChB, MPH, FRCPC
- awareness of existing research and syntheses,
- methods for PPH evidence synthesis,
- production and dissemination of new research and syntheses.

**Issues of Knowledge Transfer and Exchange**
- researchers’ need for support in knowledge exchange activities,
- recognition and tackling of the lack of academic reward for knowledge exchange activities that are designed to reach the PPH user,
- need to develop and utilize electronic dissemination methods,
- need for more active knowledge exchange.

**Issues of Knowledge Uptake and Utilization**
- need for relevant and timely research knowledge to reach the PPH user, in usable formats,
- need for ongoing training in PPH organizations to access, consult, and also produce relevant research,
- need for a shift in the culture of PPH organizations to value research as an integral component of policy and program design, and decision-making.

**Issues of Evaluation**
- need for evaluation of the effectiveness and efficiency of knowledge transfer/exchange strategies, in multiple populations and settings,
- need for evaluation of knowledge uptake and incorporation into policy and decision-making,
- need for evaluation of impact on population health outcomes.

Out of these combined observations and discussions from the literature review, key informant interviews and consultations conducted by IPPH and CPHI across country, two structures emerged to help meet these needs in a Canadian context:

1) a national Centre of PPH research evidence with a mandate to:
   a) register, collate, coordinate, and commission relevant research evidence (both primary research and synthesis research)
   b) facilitate knowledge exchange of this evidence through a comprehensive, coordinated transfer and exchange strategy,
   c) support and coordinate shared expertise in PPH knowledge exchange and uptake, concentrating on developing and evaluating strategies that are successful in PPH policy and practice environments,

2) a supporting nation-wide Network of PPH practitioners and research experts, including experts in PPH knowledge exchange and uptake, to identify and address evidence gaps, and continually improve the methods of both conducting PPH research and achieving its utilization in the PPH community.

The development of new structures to assist with the production, dissemination and uptake of relevant, high-quality PPH research evidence and its implementation into PPH policy and programs faces myriad challenges, many of which have been described here (e.g., coordination of efforts among diverse stakeholders, across Canada and internationally; quality assurance and consistency of research; methodological development; effective knowledge dissemination to users; incorporation of research evidence into practice; rigorous yet feasible evaluation of functions; and sustainable funding). The themes of these interviews are echoed in other consultations of PPH stakeholders, which also called for the:
- creation of linkages between researchers and users,
- involvement of policy-makers in knowledge generation and exchange,
- agreement about appropriate research methodologies and standards of evidence,
- integration and increased linkages between databases of research evidence,
- active encouragement and stimulation of knowledge exchange and uptake (KEU),
- elimination of regional disparities in research and KEU, and
- improvement of research and KEU collaboration between regions and organizations.

The report is informing the efforts of CIHR’s Knowledge Translation Branch, the directors of the CIHR-IPPH and CIHI-CPHI, and is expected to also guide the work of the Public Health Agency of Canada and the National Collaborating Centres for Public Health.

**FOREWORD**

In the wake of Severe Acute Respiratory Syndrome (SARS) and other public health crises, this report, originally prepared in 2002 and intended for facilitating broader dialogue among Canadian public health leaders and professionals, has become even more relevant given the prominence of public health in the federal/provincial/territorial landscape. Centrally, the ability of health professionals to practise evidence-based public health is challenged, at times, in environments of great pressure for their time and attention, and exceptional lack of scientific certainty.

Minimally, the practice of evidence-based public health requires that the right people have the right information at the right time and in the right formats (i.e., “just-in-time” access to evidence). Now more than ever, there is unprecedented opportunity to institutionalize processes and structures that can support evidence-based decision-making, within both existing agencies – such as the Canadian Population Health Initiative of the Canadian Institute for Health Information (CIHI-CPHI) – and the newly established Public Health Agency of Canada (PHAC) and the National Collaborating Centres for Public Health.

Several Canadian reports, commissions, and consultations (e.g., the Romanow Report, the Naylor Report, the Kirby Report, the Walker Panel, the Campbell Commission, the Ontario Operation Health Protection, and the Public Health Think Tank) have consistently highlighted the plight of an under-resourced and often-ignored public health “system”, which finally received a “boost” in the March 2004 federal budget. These reports issue resounding calls to enhance the capacity to practise evidence-based decision-making (EBDM) in public health through a number of related activities:
- improving the knowledge base in public health, through targeted primary research, synthesis research, and evaluation activities,
- setting cohesive and coordinated national public health priorities, including priorities for research,
- fostering national and international networks for both research and public health practice,
- creating linkages between and among researchers, policy-makers, and government decision-makers to foster bi-directional exchange of information and resultant EBDM,
- creating mechanisms to provide evidence-based scientific and technical advice to practitioners,
encompassing: enhancing training of public health personnel in EBDM,
creating optimal knowledge transfer and exchange systems, including evidence-based standards, guidelines, and best practices,
creating a central resource for publicizing current methods of knowledge exchange and EBDM, and
creating an evidence-based public health services system, and pan-Canadian public health network.

The National Advisory Committee on SARS and Public Health (the Naylor report)\(^7\) proposes that the new Chief Public Health Officer shall “elevate the quality of public health practice…through the advancement of appropriate standards and research priorities.” Activities would include knowledge translation, research, infrastructure, [and] international collaboration (p. 77), in addition to spearheading the development of a national public health strategy based on national public health priorities (p. 214). This report outlines current thinking around EBDM in public health practice, particularly in the Canadian context.

Please note that an explanatory Glossary of Terms and Acronyms is included at the end of this paper.

**INTRODUCTION**

The Canadian Institutes of Health Research Institute of Population and Public Health (CIHR-IPPH) has a mandate to support and catalyze innovative research into the broad determinants of health. Moreover, it also has a legislated mandate to ensure that the research is actually used – by policy-makers, program administrators, public health practitioners, and community-based organizations – to improve the health of Canadians.\(^9\) Each of the 13 Institutes of the CIHR is mandated to work toward effective “translation” of funded research knowledge into practice (Appendix 1 illustrates one such Knowledge Translation framework developed by CIHR). In addressing this mandate, the IPPH, in collaboration with the Canadian Institute for Health Information, Canadian Population Health Initiative (CIHI-CPHI), conducted a ten-city, nine-province series of stakeholder consultation meetings in late 2001, the results of which have been published.\(^9\) Among the issues identified by more than 400 population and public health (PPH) research producers and research users\(^*\) was the need in Canada for a standardized, widely disseminated and high-quality repository (e.g., database) summarizing the current scientific evidence, from multiple disciplines, on the relative effectiveness and efficiency of key PPH interventions. Examples of interventions could include “Best Practice” approaches to prevent and control communicable and non-communicable diseases, as well as community-level programs to tackle chronic disease risk factors such as teenage smoking, overweight, unhealthy eating and sedentary habits, asthma precipitants and barriers to asthma control, as well as a wide range of other health protection and promotion interventions. These stakeholder consultations also identified the need to engage the ultimate users of new knowledge early and often in the research process, in order to facilitate the productivity of knowledge relevant to policy and practice. These concerns have been further echoed in a “Think Tank” meeting of experts in 2003 concerning the future of public health in Canada.\(^7\)

Consequent to repeated identification by PPH stakeholders of issues around access to, quality of, relevance of, and incorporation of research evidence into decision-making, the CIHR-IPPH established a small working group (the authors of this paper) early in 2002 with representation from government, researchers and research funding agencies. The CIHR-IPPH retained a consultant (LK) to perform an environmental scan, exploring some of the current evidence synthesis and dissemination activities of relevance to PPH in Canada, in what settings and institutional contexts, with what substantive foci, and under what funding arrangements. As well, representatives of key organizations in North America and the United Kingdom were interviewed regarding the same issues (see Appendix 2). This report is a summary of these investigations.

**OVERVIEW**

Research evidence can and should be a vital component of the policy-development and decision-making processes that occur within public health agencies. Brice and Muir Gray\(^10\) observe that knowledge, when judiciously applied, can help to address seven problems in health system decision-making, namely:

- unknown variations in policy and practice,
- waste,
- errors,
- poor quality care/practice,
- poor client experience,
- over-enthusiastic adoption of interventions of low value, and
- failure to implement interventions of high value.

Policy-makers, researchers, and the Canadian public expect public health practice and “healthy public policy” to be informed by the best-available scientific evidence.\(^12\) Yet public health decision-makers report that “Policy directions are not seen as being based often enough” on relevant research;\(^12\) (p. 37) despite an expressed desire to do so.\(^13\) Mowat and Hockin\(^14\) cite a widely recognized “need to use information more effectively to inform policy-making, program development and operational decisions in population and public health” (p. 19). The CIHR-IPPH is acutely aware of the need to incorporate relevant, high-quality scientific evidence into public health decisions, programs, and policy. It is increasingly recognized that research users find it difficult to access and incorporate into practice and policy thorough, relevant, high-quality research evidence on population and public health interventions.

Currently, a number of factors within the Canadian public health services system contribute to the limited application of research evidence within program decision-making and policy development.\(^14\)-\(^17\) For example, there is:

- a lack of awareness of existing research, both nationally and internationally,
• limited ability of decision-makers to appraise the methodological quality of research, and appropriately ascertain and apply different “levels” of evidence; and

• uncertainty of decision-makers about how to apply the findings of research evidence in policies, programs, and practice.

Moreover, the continually broadening evidentiary scope of public health practice necessitates new information needs, spanning not only its original bases in environmental health, communicable disease prevention and control, and disease surveillance, but also prevention of chronic diseases, mental health promotion, maternal and newborn health, “safe communities”, inequities in health due to social and economic determinants, food security, safe and affordable housing, and even occupational health. These issues are not unique to Canada; in the United Kingdom, for instance, there is recognition that needed knowledge is generated, organized, delivered before and during the process of decision-making, and appraised and appropriately used. The issues herein are multiple and complex; some are already well documented, and others are under investigation, as many researchers and funding bodies turn their attention to knowledge synthesis, exchange, uptake and utilization.

Although not a new field of research in the broad context (research dissemination and utilization have been studied in the health care sector for more than 20 years), concepts such as knowledge transfer, uptake and utilization; knowledge linkage and exchange; knowledge management; and evidence-based decision-making, are in their infancy as compared to these other concepts (e.g., research dissemination). After decades of research evaluating the impact of dissemination strategies on research utilization, there are very few definitive answers as to how to promote the effective use of research evidence in practice, program planning, and policy development. The focus, therefore, has turned toward the underlying processes and factors that significantly impact on decisions to incorporate research evidence into policy and program decisions, as well as on the impact of increased interaction between research producers and research users on uptake. Reflecting this evolution of theory, the terminology also has transformed. To suggest the ideally bi-directional flow of information and ideas between research producers and users, this paper will use the term “knowledge exchange and uptake” (KEU) rather than the more common “knowledge transfer and uptake” and “knowledge translation”.

This discussion paper is based on both the current literature related to KEU in PPH settings (much of which is Canadian) and the findings of interviews with selected Canadian and international organizations that perform systematic review/meta-analysis of population- or community-level (as opposed to clinical or one-on-one) interventions in PPH. These interviews delineate some of the organizational structures that currently exist to promote the creation and use of research evidence (e.g., systematic reviews) relevant to PPH, and help to identify possible models of integrated evidence synthesis and dissemination that might be successful in Canada.

Policy-makers in PPH must act based on the best available knowledge and evidence, usually under time pressure, with substantial resultant political, economic, social, ethical and health ramifications. In some cases (e.g., communicable disease outbreaks or toxic spills), response must occur immediately, while other situations are considered less time-sensitive (e.g., public health department “Heart Health” program design), allowing time to amass and review available literature, canvass other jurisdictions, and consider all options. In both scenarios, however, easy access to the evidence base of “quality information, presented in a usable fashion on what we know, what we do not know, and the extent of the uncertainty and risks involved in various alternatives” (p. 106) is critical to effective and efficient public health practice. Topical examples of the requirement for evidence include West Nile Virus prevention through the use of pesticides, and SARS prevention through the use of personal protective equipment. Applied research evidence has the potential to improve decision-making, policy development, public health program delivery, and population health outcomes. However, Schabas notes that “public health practitioners must live with uncertainty and make decisions based on an assessment of the best available evidence” (p. 98). Moreover, decision-making may be hampered by the challenge of interpreting research evidence that is of good quality, but the results of which are conflicting. Unfortunately, for many complex reasons (discussed later), there is often a dearth of easily usable research information relevant to many PPH interventions, compared to the plethora of evidence that addresses many clinical interventions (often conveniently reviewed and summarized in “practice guidelines” or meta-analyses).

Two noteworthy types of summaries of research evidence derive from synthesis research: systematic review and meta-analysis. Systematic review is a research methodology that pulls together and synthesizes the best available existing evidence on a given question; meta-analysis takes this one step further by mathematically aggregating available data from independent studies to yield a more statistically powerful, integrated result (for example, a weighted effect-size across comparable intervention studies). The utility of systematic reviews (SRs) is discussed further in Section 5 of this paper.

It is expected that several audiences will find this paper of use to them: health policy decision-makers at all levels, senior officials in Federal, Provincial, Territorial Ministries of Health, as well as other ministries, and research “producers” and “users” in public health practice throughout Canada and beyond. A more inclusive consultation strategy is anticipated, comprising a wider range of stakeholders in the public health research, practice, and policy communities, and will explore the details of best-practice models by which to achieve the ultimate goal of optimum integration of PPH research evidence into policy and program planning. 
diseases such as hepatitis B and C). Although researchers have been attempting to address the gap (e.g., the Effective Public Health Practice Program*; the CIHI-CPHI†; the Task Force on Community Preventive Services Community Guide‡; the Campbell Collaboration§), existing sources of expertly-synthesized research evidence (e.g., the Cochrane Collaboration) traditionally have focussed largely on clinical care and have only recently begun to address questions of immediate relevance to PPH.35,36 Moreover, the research methodologies and standards of evidence used in these two broad fields differ substantially. For example, ecological, observational, quasi-experimental, and time-series designs to evaluate intervention effectiveness are often the only sorts of evidence available and in fact appropriate or sufficient to inform the PPH field, versus the more stringent, yet narrowly-applicable randomized controlled trial (RCT) design which is predominant in clinical settings.37-40 Unfortunately, current widely-used methodologies for synthesis research are not able to account easily for the types of study design commonly used in PPH research, and much valuable evidence is excluded from review;41 however, new methodologies continue to be developed to meet this urgent need.42 "Best or Better Practices" represents yet another approach, based largely on less rigorous study designs of practices and programs, and often focusses on particular organizational behaviours for which conclusive quantitative evaluations are inherently difficult to design and execute (e.g., evaluation of municipal water treatment disinfection and monitoring practices and policies; degree of implementation of workplace health promotion interventions). Akin to the model of "evidence-based medicine" used in the clinical setting, PPH researchers and practitioners need to work together to create an acceptable and scientifically-rigorous methodology for reporting, analyzing, and synthesizing knowledge for informing PPH in "real world" settings, providing the much-needed external validity not available from reviews of efficacy trials.35,38,41 A final approach involves modeling exercises, seeking to estimate the impact of interventions through methods of combining evidence from various sources, such as the prevalence/incidence of risk factors or disease, the natural history of the disease, and available evidence on the impact of interventions. Examples of this type of evidence include simulating the impact of various screening approaches for cancer (e.g., Montreal Prostate Cancer Model§) or infectious diseases (e.g., the "Montebello Process"44).

A related issue is the need for the PPH research and practice communities to critically reflect on the appropriate application of different types or levels of PPH evidence to policy and practice. Nutbeam45,46 proposes a four-level typology of increasingly informative levels of research knowledge evident in the PPH field. The most abundant type of research knowledge is basic epidemiologic and demographic description and analysis of surveillance data, which helps to define and describe PPH problems – for example, the rates of syphilis or colorectal cancer in the community. A second type of research is social, behavioural, and organizational research, which sheds light on target, at-risk populations, their characteristics and environments, as well as potential interventions that may improve health – for example, the use of condoms in male bath-houses, or uptake of screening for colorectal cancer. Taking this level of evidence a qualitative step further constitutes evaluative research, which tests the efficacy (experimental, ideal "research world" impact) or effectiveness ("real world" impact) of a proposed intervention – for example, placing free condoms in bath-houses, or promoting population-based colorectal cancer screening. The fourth, and least abundant, level of evidence examines the ways in which successful interventions can be widely implemented, including how to "diffuse" and "institutionalize" ideas and interventions – for example, methods to create a norm of condom use in casual sex settings, or social environments in which colorectal cancer is acknowledged unapologetically. Although each of these four levels of evidence contributes valuable and necessary information to the research field, the third and fourth levels are most informative to policy and program development because they evaluate potential interventions (see also ref. 36).

For example, several types of research evidence inform tobacco policy:

- descriptive studies of smoking prevalence and incidence,
- etiology studies about the relationship between smoking and various health outcomes,
- modeling studies that combine this information into smoking-attributable outcomes,
- primary studies and syntheses of interventions to prevent smoking and health outcomes,
- studies of the potential community effectiveness of those interventions,
- studies of the costing and resource implications of interventions,
- studies about the feasibility and larger impact of delivering the interventions.

Evidence from community-based research is also emerging, based on the use of participatory action research which places emphasis on collaborative engagement of communities in the research process, with the view to combine knowledge and action to improve the health of communities and support social change.47 All of these levels of evidence are reflected in program planning frameworks, frequently used by health departments, such as the Iterative Loop48 and Needs-Impact Based Planning,49 in that PPH programs commonly do not begin from the reference point of research evidence of effectiveness, but rather with an identified
public health problem: for example, a health status assessment (epidemiologic data) reveals leading health problems. This is followed by identification of populations at risk and a search for potential efficacious interventions to address the problem. Evidence is sought of how to effectively and efficiently implement the various interventions, taking into account the resources and capacity that are both required and deployable, as well as methods to evaluate their short- and long-term success.

Thus, a strategy to address the PPH knowledge gap faces several methodological and other challenges: 

1) evaluation of the effectiveness of political and complex interventions, especially over the long term, within social and economic environments;

2) a body of evidence that often is observational (e.g., quasi-experimental studies) rather than based on controlled trials (typically viewed as the “Gold standard”);

3) a body of evidence that often reports conflicting results of effectiveness of interventions;

4) a lack of appropriate and widely-accepted synthesis methodologies for the preponderant study designs; and,

5) dissemination of results to a diverse group of practitioners, largely in complex institutional settings.

Several Canadian authors suggest specific strategies to support evidence-based decision-making in PPH, including: improving access to information (including systematic reviews of effectiveness of PPH interventions), developing better tools to find, integrate, analyze, and present information that is relevant to PPH, and furthering public health practitioners’ skills to appraise this evidence. Other strategies include: building a research transfer plan into each research project (e.g., as a requirement of receiving funding), employing specialists in knowledge exchange (e.g., “knowledge brokers” and “connectors”), and encouraging empirical investigations of knowledge exchange.

However, it is critical to recognize that barriers to the incorporation of research knowledge into practice and policy are not limited to those of knowledge-access alone. Values, ideology, source of knowledge, and precedent are other salient variables in the PPH equation, and research evidence often lags behind concerns about “acceptability” to stakeholders and the public, and financial cost.

Research uptake is strongly determined by the organizational environment and “culture” within which the researcher/user works. “Diffusion of Innovation” theory predicts that certain organizational features (such as the degree to which an organization values research evidence and encourages ongoing professional training in research methods and critical appraisal) facilitate the early adoption of innovations such as new PPH interventions, and even the use of research evidence itself (as an innovation). Moreover, research evidence is used by policy-makers in a range of ways (e.g., as either the primary or, more usually, as one of many inputs to policy), and for a variety of purposes, for example, to justify existing programs and policies, a decision already made, or to justify organizational inaction. Weiss theorizes that knowledge is used in three ways— instrumentally, where research evidence directly and explicitly informs a decision; conceptually, where it

---

NATURE OF KNOWLEDGE TRANSFER/EXCHANGE AND UPTAKE IN POPULATION AND PUBLIC HEALTH

Because usable PPH research evidence is often difficult for policy and program decision-makers to access, effective knowledge exchange and uptake (KEU) strategies are increasingly recognized as critical components of initiatives meant to support evidence-based decision-making (EBDM). An overarching objective of the CIHR-IPPH is to develop capacity within Canada not only to produce high-quality PPH research, but also to incorporate it into policy, program, and practice decisions. A key strategy to achieve the incorporation of research evidence into practice is to build bridges between the producers and potential users of research evidence, thereby encouraging the production, dissemination, and uptake of relevant research. The utility of this approach was emphasized during the CPHI/IPPH cross-Canada consultation process by PPH stakeholders who felt that traditional, unidirectional research transfer approaches, led largely by researchers, should be replaced by knowledge exchange activities that actively engage research users of evidence in the research process early and often. For example, publication of research evidence in a peer-reviewed journal should be supplemented by presentation at interactive workshops and meetings.

Canadian experts have noted that much KEU in PPH occurs through “socialization in communities of practice” and requires collaboration among professionals, practitioners, and researchers such that those with questions can find those with answers. Although several initiatives have been undertaken in Canada toward achieving these goals (e.g., various Canadian Heart Health Initiative Dissemination Research Projects, Consortium for Applied Research and Evaluation in Mental Health), it is currently unclear how successful these efforts have been in facilitating the broad and routine utilization of PPH research evidence by end-users in PPH policy-making and practice across the country. One example of a community of practice comes from the UK. Recent work in the UK has explored the use of “public health networks”, conceived chiefly as a means of supporting PPH practitioners who have become geographically isolated in the recently decentralized organizational structure of Primary Care Trusts. The network, as envisioned by the practitioners themselves, is really a network of networks, based on areas of expertise and interest, and would likely exist electronically, with occasional in-person meetings. The networks would:

- allow the identification of expertise in PPH content areas,
- maximize scarce resources by sharing information and avoiding duplication
- provide a venue for continuing professional education/training
- facilitate information exchange (especially of unpublished reports and “gray” literature) and knowledge management.

At the same time, it is envisioned that these practitioners will be supported in their evidence needs by a knowledge management
It has been noted that “researchers too often provide answers to questions in ways that are either not fully useful or meaningful to policy-makers” (p. S2). In addition, researchers have tended to use dissemination vehicles that are not necessarily those drawn on by decision-makers, as evidenced by the observation that only 34% of PPH decision-makers cite academic/professional conferences as a source of information, and only 61% consult professional/scholarly journals, the two most common methods of academic research dissemination (see also ref. 13). With respect to dissemination of systematic reviews, Ciliska et al. found that Ontario PPH decision-makers preferred (in 1996) to receive a hard copy of the full SR, followed (in order of popularity) by a computer disk copy, an abstract, a summary, and an internet website URL. Information must be provided in multiple formats, such as fact sheets, newsletters, project reports, executive summaries, jargon-free summaries, abstracts, a summary, and an internet website URL. Information is disseminated through to its use or non-use in clinical practice guidelines, and e-mail notification list-serves. Finally, to maximize the use of systematic reviews as sources of PPH evidence, research producers and others must increase awareness about SRs, position them as relevant to PPH policy and practice, provide identification of and access to them, and create networks of interested persons such as the Cochrane and Campbell Collaborations to promote and produce them.

However, there is an urgent need for a shift from the usual passive methods of dissemination to more active methods. PPH decision-makers in Canadian health regions have suggested that to facilitate the use of research, there must be better communication between research users and producers, to tailor the research evidence so as to be relevant, timely, readable, and accessible. Regularly-scheduled meetings, colloquia, and research workshops are potential communication strategies to help elucidate health regions’ values, interests, and information needs, and to provide assistance with the formation of policy-relevant research questions. Moreover, a “participatory approach” that involves health regions from research inception through to dissemination may also enhance the health region’s commitment to research and hence uptake.

Several frameworks for knowledge transfer and exchange have been developed over the last two decades across multiple health care disciplines including PPH. Generally, these frameworks have depicted the process that occurs from the point at which research evidence is disseminated through to its use or non-use in clinical practice or policy-making. Others have considered the degree to which policy has been based on research evidence and the determinants thereof. Factors that facilitate or hinder the use of research evidence in policy/practice have been identified, and associations hypothesized. All of the models depict similar processes, although the terminology differs to match the paradigm of the author. Older models depict a more linear process whereby various strategies are used to deliver relevant evidence to the appropriate audiences, thereby promoting its use in practice. In contrast, more recent models have highlighted an iterative process, in which researchers and decision-makers interact not only to exchange knowledge concerning the research results, but also to identify the research questions, appropriate designs, outcomes of interest, and strategies to transfer the research results to potential users. Other components of these models call for greater attention to be paid to organizational and environmental characteristics, decision-making processes, and the identification of appropriate definitions and measures of research use.

Decision-making in public health organizations is often a complex process and is necessarily subject to the specific organizational environments and political, economic, and socio-cultural contexts in which the decisions are made. Not only the types of decisions but also the nature of decision-making in these contexts likely differ in important ways from provider-patient clinical decision-making interactions regarding personal health-care decisions. In response to this recognition, recently several studies have focused on how research evidence informs decision-making in PPH program and policy development. Indeed, the iterative processes of knowledge generation, exchange, uptake and utilization may be specific to the organizational environment in which they occur. Nonetheless, theoretical models of evidence generation and subsequent knowledge exchange and dissemination (KEU) should be used in these contexts. Indeed, the iterative processes of knowledge generation, exchange, uptake and utilization may be specific to the organizational environment in which they occur. Nonetheless, theoretical models of evidence generation and subsequent knowledge exchange and dissemination (KEU), share several common elements and functions, which are generically depicted in Appendix 1 by frameworks such as the CIHR Knowledge Translation Framework. These functions typically are performed by two or more groups (for example, research users and producers), between which effective and frequent communication must occur.

Figure 1 illustrates a proposed conceptual model and a framework of the KEU process as applied to PPH. Several salient differences between the generic (Appendix 1) and PPH-specific KEU frameworks are apparent. First, the PPH model recognizes that all activities, including KEU development and evaluation, require adequate and sustained public-sector funding, in addition to funding of research projects proper. Second, the PPH model describes a

Figure 1. Conceptual Model of a Successful, Sustainable PPH Knowledge Exchange and Uptake Process

Several functions must be accomplished in an environment of sustainable funding:
1. Active collection, annotation and registration of existing and in-progress research
2. Solicitation and identification of evidence gaps
3. Prioritization, coordination and generation of new research evidence
4a. Dissemination of existing and new research (“producer push” and “user pull”)
4b. Evaluation and redesign of knowledge exchange and dissemination strategies
4c. Capacity-building and training of users to facilitate uptake and use of research evidence
5. Uptake and utilization of research evidence
6. Iterative cycle of problem identification, policy/program development and/or decision-making, implementation, evaluation and redesign.
process to systematically and actively collect, appraise, annotate, and register relevant PPH research; in contrast, the generic model assumes that these activities occur through publication and the process of contextualizing research knowledge into current societal realities. Third, the PPH model makes explicit that new research should address user-identified evidence gaps. Fourth, the PPH model recognizes the need to evaluate the effectiveness of KEU strategies. Fifth, the PPH model acknowledges the need for capacity-building within PPH organizations to facilitate research evidence uptake and use. Sixth, the model emphasizes the ultimate incorporation of research evidence into the policy-design cycle.

**SYSTEMATIC REVIEWS READILY MEET THE NEEDS OF RESEARCH USERS**

As a vehicle of KEU, systematic reviews can be a particularly compelling methodology. Systematic reviews (SRs) of PPH interventions typically correspond to Nutbeam’s third and fourth levels of evidence and as such, are particularly relevant sources of evidence to inform PPH policy and practice. As well, they address many of the potential barriers to knowledge dissemination and uptake. SRs offer several advantages over traditional primary and secondary research. They distill large amounts of research, often reconciling conflicting results and disparate research findings. This obviates the resource-intensive and time-consuming need for skillful practitioners to find, read and appraise multiple primary research studies, often located in difficult-to-obtain publications. In fact, some experts question the appropriateness of transferring the findings of single studies, and argue that research syntheses of bodies of literature have much greater utility. What is more, although SRs take much time and skilled effort to produce, an SR that is also well disseminated saves practitioners – across each of the approximately 130 Canadian health regions, public health departments, ministries of health, branches/divisions of Health Canada, the Public Health Agency of Canada and the six national Collaborating Centres for Public Health – from having to perform such a task. Furthermore, SRs are able to synthesize different types of information, perhaps derived from different study designs. Moreover, an extensive search for relevant literature, the application of a strict methodology and an objective framework of analysis avoids some of the serious biases inherent in traditional “discursive” methods of research review, such as omission of relevant research and details about the context in which the research was conducted, focus on research with weak methodology, and use of explicit inclusion criteria. In addition, the exercise of performing a systematic review allows gaps in research knowledge to be identified systematically, directing future primary research to close the gap. SRs can overcome KEU barriers related to the user’s lack of access to journal articles and primary research, in addition to the lack of time to read, and skills to appraise, such articles. Finally, SRs may be disseminated in a variety of formats, suited to the skills and information needs of the users (e.g., executive summaries, “lay-language” summaries, brief reports, and full reports).

Having stated the advantages of systematic reviews, it must be noted that they exhibit several concomitant limitations, a major one being the loss of salient, even crucial information – particularly that relating to study design, the context of the research intervention, and its generalizability to the practitioner’s own policy and practice situation. However, some authors attempt to preserve and even highlight this important contextual information (e.g., The Effective Public Health Practice Program – EPHP – see earlier footnote). Other criticisms include the possible introduction of bias by limiting study inclusion to English language or published studies, inadvisably pooling studies despite evidence of heterogeneity, and imprudent reliance on a summary estimate of effect despite poor quality of the composite studies. Finally, it has been noted that in some circumstances, Health Technology Assessments, with their deliberate inclusion of cost-effectiveness data and consideration of broader sorts of evidence (such as expert opinion), can be more useful to decision-makers than are SRs. Hence, SRs must be used judiciously, with the research user asking themselves whether or not they have procured the right information to inform their decision.

Several Canadian authors have investigated the use of systematic reviews and have found that public health decision-makers report a high and often unmet need for usable research evidence. For example, Ciliska et al. surveyed Ontario decision-makers in Public Health Units and the provincial Ministry of Health about their access to and use of SRs; almost three quarters of respondents reported a “high” or “very high” need for research information, and more than half stated that this need was not being met. Many (43%) reported having performed or requested a literature search in the past three months, demonstrating a frequent need for scientific or evaluative information. Barriers to research uptake which decision-makers rated as at least moderately serious were time to amass and review literature (92%), availability of research (83%), research question relevance (76%), and timeliness of receiving needed research results (70%). Decision-makers supported SRs as an important component of an overall PPH research agenda, with 62% saying SRs should be “high” on such an agenda. They perceive that SRs will help to overcome research-utilization barriers such as the user’s limited time, financial costs of obtaining research evidence, and poor timeliness of receiving the sought-after research articles.

Although much PPH professional decision-making is based appropriately on experience, expert opinion, and considerations other than formal research evidence, the use of systematic reviews in decision-making is relatively popular in Ontario Public Health Units, with the majority (63%) of surveyed decision-makers reporting having used one in the past two years to help make a decision. Compared to traditional primary research studies, users felt that SRs helped them to overcome barriers posed by their limited critical appraisal skills (especially appraisal of study methods), and were widely accepted as sound evidence for program justification and planning. A recently-conducted qualitative study of public health decision-makers across Canada, demonstrates the value that decision-makers place on research evidence, including SRs, in decision-making, especially evidence that they perceive as credible (i.e., free from undue influence by political or economic agendas) and of high methodological quality. For example, respondents stated:

“It (evidence-based decision-making) is reviewing the literature or reviewing the summaries of literature reviews or the benchmarking material to look at what has been demonstrated to be effective under
what particular circumstances, and then using that information to make a program decision."

"Evidence-based decision-making is looking at all of the information you have available, whether it is a literature search, reports, local community data, or what is happening in the province, to help you make a program decision."

"The systematic reviews I think are wonderful. They have really informed a lot of what we do at our health unit. Because I know the authors of the reviews have gone through all that research, they have taken a look at the methodology, they have looked at whether it's valid or not and can say, based on all of this, this is what we are finding."

In summary, policy- and practice-relevant systematic reviews performed by trained researchers can help to meet the needs of PPH users. With the need for evidence and the advantages of synthesis research described, we sought to understand some of the mechanisms by which this knowledge can be produced and its use in practice fostered. To this end, we interviewed producers of PPH-relevant research, the methods and results of which are described below.

**INTERVIEW METHODS AND THEMES**

**Interview methods**

A list of 33 Canadian (n=19), US (n=5), and UK (n=9) research organizations was generated by the working group, key informants, and the interviewees themselves through "snowball" sampling (see Appendix 2); these organizations were chosen to be interviewed because they perform PPH-relevant synthesis research, although a few organizations that chiefly perform health services, occupational health, and economic and policy research were also included. The first author (LK) conducted all interviews. Additionally, organizational websites were reviewed for salient information. Particular contact individuals were identified at each organization, and the consultant contacted the identified individuals by e-mail or phone to request an interview. No organization refused to be interviewed, and several suggested further interviewees. A questionnaire was created by the working group, but was not formally piloted or validated. Prior to the interview, interviewees were sent a brief description of the content areas of the interview, as follows:

1. The core functions of their organization, and how these relate to synthesis research;
2. How their public and population health research “agenda” is decided;
3. How it is achieved;
4. How it is funded;
5. How and to whom the results are disseminated;
6. Who their partners/collaborators are;
7. How the quality, uptake and impact of their research is ensured and evaluated;
8. Their sense of what is needed to improve research uptake and use by public health practitioners;
9. Finally, interviewees were asked about their impressions of creating Canadian organizations
   • to collate and consolidate existing PPH evidence,
   • to coordinate Canadian synthesis activities, and
   • to disseminate the results of research syntheses to Canadian PPH decision-makers.

Each telephone interview took approximately 60 minutes to conduct, and thoroughly explored the above questions, yet was relatively informal and open. The interviewer prepared a written summary of each interview, and gave the interviewee two opportunities to review, correct and expand upon it.

**Interview content themes**

This environmental scan of the activities of PPH research agencies was not intended to be exhaustive, as the goal of the interviews was not to chronicle the precise state of PPH research production and knowledge translation at that moment in time, but was rather to gain a broad understanding of the general processes and structures that can support it, and observe some examples thereof. As such, only a sample of research groups were interviewed, and not all Canadian provinces and territories are represented. Nonetheless, several generalizations can be made about Canadian PPH research and research synthesis and dissemination practices. Research producers can be classified into three broad categories, operating in varying degrees of collaboration with one another: university-based academic research units; independent and often specialized research units; and governmental research branches and projects.

It is clear that excellent PPH research, training, and capacity-building activities are underway across Canada and elsewhere. However, efforts are still largely uncoordinated, with researchers often unaware of the existence, scope, and specific projects of research elsewhere. Duplication and overlap of research occur throughout the country and internationally. Similarly, responsibility for particular subject areas of research is fragmented, such that aspects of related research are undertaken independently by different research units, without coordination. With the exception of international and specialty “trial registries,” no process exists whereby researchers can formally share information or notify others about their work. It is also clear that the production of much PPH research is dependent upon the existence of well-funded, university-based research units, usually those affiliated with one of Canada’s 16 medical schools. As such, there is both a regional disparity and an urban focus in research production, with a high proportion of applied PPH research in English Canada occurring in Ontario and its five medical schools. No mechanism exists to ensure that research needs of all regions are met or even considered. Although many research units canvass their identified users about their evidence needs (and some even act on unfunded requests), no formalized process exists by which researchers and funders can ascertain the current needs, nor is there a formal process to prioritize needs. Many of the current research initiatives derive from the interests of the researchers, without specific plans for their uptake and implementation.

PPH researchers view effective KEU as a daunting challenge, and articulate widespread agreement that improved dissemination techniques, practices and evaluation should be developed. Most

---

* A “trial registry” is a database of research in progress, and requires that researchers actively forward information about their research projects to registry administrators for inclusion. Typically, they focus on randomized controlled trials of clinical interventions (e.g., the Cochrane Controlled Trial Registry). Currently, both awareness and use of trial registries are limited.

† The lack of communication among and between researchers and policy-makers is further amplified between English and French Canada, evidenced by a profound unawareness in English Canada of the extensive applied research and synthesis activities occurring in Quebec.
actively be looking for the information, and look in the right place. There is no comprehensive national source of or link to the existing PPH evidence base, and certainly no centralized source of quality- and relevance-appraised evidence to facilitate “user-pull” of research evidence. For academics, a cultural barrier to effective KEU exists, in that there is typically a lack of reward for KEU activities other than publication in academic, peer-reviewed journals. Not only are KEU activities time-consuming and costly, many academics have neither the skills nor the interest to perform these tasks well. Some well-resourced research organizations have access to dedicated KEU staff (e.g., communications and market research experts), and some even commission external parties to perform knowledge translation. Moreover, some research-funding bodies (e.g., especially in the UK; in Canada, the CIHR-IPPH and some others) are building into their grant requirements the need for a research dissemination plan, albeit with small allocated budgets.

In short, there is no formal Canadian process by which to identify and address national PPH evidence needs. Because the responsibility for health lies, decentralized, with each of the 13 provinces and territories, and in the case of PH, with some 130 local/regional health authorities, Canada has a multitude of health systems and plans. Hence, Canadian experts recommend collaboration and the creation of a comprehensive research agenda to address gaps in the knowledge base, translation, dissemination and uptake (see also refs. 1-3, 5, 7, 28, 76, 77). Additionally, Canada requires ongoing assessment of the current needs for scientific information of the PPH community, including the sort of research PPH research-funders should and will fund in the future. In contrast, both the US and the UK have better-developed mechanisms to address national priorities, at least in part, through research agencies and clear statements of national health goals. For example, the US Task Force on Community Preventive Services derives its research mandate from “Healthy People 2000/2010” objectives, and is funded to assess the quality of available evidence on the effectiveness and cost-effectiveness of essential community preventive health services and develop recommendations for policy and practice based on the evidence. Similarly, the UK National Health Service (NHS) funds the Health Development Agency and the Centre for Reviews and Dissemination to foster the generation, dissemination and use of research evidence in public health practice and policy, with direction derived from the Department of Health and NHS priorities and policy documents (e.g., the NHS plan and “Saving Lives, Our Healthier Nation”).

Based on stakeholder consultations, and corroborated by the current literature, an ideal structure and process to promote the creation and use of research evidence (e.g., SRs) on PPH interventions would:

- be user-centered and responsive to salient and emerging identified gaps in evidence, users’ evidence needs, and user-preferred formats of information exchange;
- develop capacity in users to access, interpret, use and even produce research evidence;
- be flexible in scope and capable of producing rapid results when required;
- be autonomous and credible, and ensure research of high quality, using and developing consistent and widely-accepted research methods;
- be national in scope, collaborate internationally with similar organizations, and therefore efficiently avoid duplication of efforts;
- partner with relevant Canadian agencies, organizations, associations, and networks, as well as involve and coordinate multiple sectors (e.g., local, regional, provincial, territorial, and federal public health authorities, universities, research agencies, non-governmental organizations, and special interest groups);
- develop, use and evaluate effective methods of knowledge exchange and uptake;
- evaluate the overall process and health impact of research integration into PPH policy and practice; and
- draw stable funding from a variety of sources, with long-term, core funding for infrastructure.

### Possible structures

From the identified necessary attributes and functions, the working group identified two rather different sorts of “institutional element” descriptions, suggesting the need for two kinds of organizational structures to achieve PPH KEU in Canada:

1. a national Centre of PPH research evidence to register, collate, coordinate, commission, disseminate research evidence, and evaluate its impact, and

<table>
<thead>
<tr>
<th>Research Users</th>
<th>Research Producers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local and regional public health departments</td>
<td>University-based PPH research units (e.g., EPHPP, IPH)</td>
</tr>
<tr>
<td>Provincial/Territorial ministries of health, social services, justice, education, environment, etc.</td>
<td>Individual research scholars</td>
</tr>
<tr>
<td>Health Canada, Public Health Agency of Canada, and other federal ministries</td>
<td>Other research institutes and agencies (ICES, CIHI-CPHI, IWH, AHFMR/SEARCH)</td>
</tr>
<tr>
<td>Non-governmental and voluntary sectors</td>
<td>Provincial/Territorial ministries of health, etc.</td>
</tr>
<tr>
<td>Health care providers</td>
<td>Health Canada, Public Health Agency of Canada, and other federal ministries</td>
</tr>
<tr>
<td>Hospitals and health care institutions</td>
<td>Non-governmental and voluntary sectors</td>
</tr>
<tr>
<td>Professional associations</td>
<td>Industry and private sector (e.g., vaccine companies)</td>
</tr>
<tr>
<td></td>
<td>Local and regional public health departments and collaborations (e.g., PHRED)</td>
</tr>
</tbody>
</table>

* As mentioned previously, substantial overlap exists between these designations, such that individuals and organizations both produce and use research.
2. a supporting nation-wide Network of PPH policy-makers, practitioners and research experts, including experts in PPH KEU, to continually improve the methods of both conducting PPH research and achieving its utilization in the PPH community.

Among its core functions, the first structure would consolidate, house and disseminate, as well as critically appraise the applicability to Canadian contexts of the many global sources of research (including SRs) relevant to PPH programs, policies and practice. Further to this “clearinghouse” function, it would actively identify important and emergent PPH evidence gaps, and would facilitate closing these gaps by encouraging and coordinating the production of new research evidence. With participation from local, provincial, territorial and federal public health authorities, as well as the PPH research community, a Centre of PPH Research Evidence would function as an “active observatory” of public health evidence needs. Addressing the critical but often neglected functions of KEU, the Centre would support and coordinate shared expertise in PPH KEU, concentrating on developing and evaluating KEU strategies that are successful in PPH policy and practice environments.

The second structure, a Network of PPH practitioners and researchers, including PPH KEU experts, would identify priority areas of PPH research and would perform appropriate research in these areas. Further, the Network would perform ongoing research on the best methods for conducting SRs and other PPH research, and for achieving their use through effective KEU. Superimposed on the PPH framework outlined in Figure 1, an Evidence Centre and Network might contribute as illustrated in Figure 2. Table I outlines the broad types of research users and producers in Canada who might be included in these structures. Table II details the necessary parties and their respective functions that are required for effective PPH research evidence generation and KEU.

CONSIDERATIONS IN DESIGNING A CANADIAN POPULATION AND PUBLIC HEALTH EVIDENCE CENTRE AND RESEARCH NETWORK

Interviewees expressed widespread support for the development of new and collaborative structures and mechanisms to promote PPH research, and its dissemination and uptake. Although we cannot presume to know exactly what a Canadian PPH Evidence Centre and Research Network should look like, interviewees imparted several clear desires and caveats, including that new structures should:

1. meaningfully involve multiple types of PPH stakeholders, including practitioners, policy-makers, researchers, methodologists, governments, funders, voluntary agencies, professional associations, and consumers of PPH services;
2. collaborate nationally and internationally;
3. not duplicate/usurp those already in existence;
4. assist researchers and users with KEU, as well as the evaluation of dissemination practices and ultimate impact of research incorporation into policy; and

Several functions must be accomplished in an environment of sustainable funding:

1. Active collection, annotation and registration of existing and in-progress research
2. Solicitation and identification of evidence gaps
3. Prioritization, coordination and generation of new research evidence
4a. Dissemination of existing and new research (“producer push” and “user pull”)
4b. Evaluation and redesign of knowledge exchange and dissemination strategies
4c. Capacity-building and training of users to facilitate uptake and use of research evidence
5. Uptake and utilization of research evidence
6. Iterative cycle of problem identification, policy/program development and/or decision-making, implementation, evaluation and redesign.

Figure 2. PPH Knowledge Exchange and Uptake Framework

The shape of the enclosure denotes the parties that are primarily responsible for achieving the specified functions.
I.12 CANADIAN JOURNAL OF PUBLIC HEALTH

A CANADIAN PUBLIC HEALTH EVIDENCE CENTRE?

Table II

<table>
<thead>
<tr>
<th>Parties and Their Activities/Functions Necessary for Effective PPH KEU of Research Evidence*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Users</td>
</tr>
<tr>
<td>Propose new priority topics for research/review</td>
</tr>
<tr>
<td>Refine/inform research questions</td>
</tr>
<tr>
<td>Uptake research evidence of PPH interventions</td>
</tr>
<tr>
<td>Policy development &amp; Decision-making</td>
</tr>
<tr>
<td>Policy/program Implementation</td>
</tr>
<tr>
<td>Evaluation of policy/program effectiveness</td>
</tr>
<tr>
<td>Policy/program redesign</td>
</tr>
</tbody>
</table>

* Ideally, “research evidence” includes both primary studies, especially those of high quality and relevance, and systematic reviews.

5. secure sufficient funding to perform the designated tasks well, including a long-term, well-funded infrastructure, with adequate staffing.

Each of these points will be discussed in more detail.

First, the optimal structure, composition and governance of the Evidence Centre and Research Network is not clear without further delineation of its functions and funding. While some interviewees suggested that the Centre be housed within CIHR-IPPH, such an undertaking is beyond its scope, and many of the functions may better reside within the Public Health Agency of Canada (PHAC), which had not yet been created at the time the interviews were conducted. How a Centre might interact with existing research agencies such as CIHI-CPHI and the Canadian Health Services Research Foundation (CHSRF) would require further discussion. Of note, although CHSRF is well recognized for advancing our understanding of knowledge exchange and transfer processes, their primary focus is on health services, rather than population and public health. Interviewees suggested that the Research Network should have broad membership, involving CIHR-IPPH and other institutes of CIHR; CIHI-CPHI; research units in all subject areas of PPH (including university-based, independent, and governmental organizations); funders; professional associations (e.g., the Canadian Public Health Association, the National Specialty Society for Community Medicine, and the Canadian Medical Association); voluntary organizations (e.g., the Heart and Stroke Foundation, the Canadian Cancer Society/National Cancer Institute of Canada, the Canadian Lung Association); the Canadian Task Force on Preventative Health Care; KEU experts; PPH practitioners; local, regional, provincial, territorial and federal decision-makers; and perhaps international members. One suggested structure of a Research Network is a Centres of Excellence model, with specific research units/nodes focusing on particular topic areas (e.g., chronic disease, communicable disease, child health, etc.), and with each health department in the country being linked formally with a research unit. Indeed, it may function as a network of networks, and could be based around the new National Collaborating Centres for Public Health. There was recognition that if the members are not paid to participate, they may need to receive a personal acknowledgement or reward for involvement. Several interviewees cautioned that research, already a slow process in itself, should not be further slowed by extensive stakeholder consultation and committee consensus meetings. To improve timeliness of research, the processes should be clear and explicit. It was also suggested that a smaller steering body, comprising key researchers, methodologists, funders, policy-makers, practitioners, and Evidence Centre administrators, should set priorities and oversee the activities of the Network. As well, the capacity to bypass normal processes in urgent situations should be built in, such as the need for prompt evidence reviews to address “public health emergencies”.

Second, national and international collaboration is key to the success of a Canadian Evidence Centre and Research Network. Many exciting PPH research and dissemination initiatives are occurring nationally and internationally, with ample opportunity to learn from the experience of others in devising effective mechanisms to facilitate PPH research and its uptake (for example, CIHI-CPHI’s policy-driven research and KEU initiatives; McMaster University’s health-evidence.ca). Moreover, as methods for PPH research evolve in Canada and abroad (e.g., systematic review methodology), it is vital to share and discuss these developments, thus improving the quality and consistency of research synthesis efforts. Collaboration would aid cross-fertilization of research
across Canada and internationally. Further, organizations that perform research in traditionally separate fields of study (e.g., health technology assessment, health promotion, health protection) can be made aware of one another’s research and encouraged to create collaborative research projects. From the standpoints of both efficiency and feasibility, it makes great sense to collaborate nationally and internationally. A recent publication from the European Union argues strongly for international collaboration (Mackenbach JP, Bakker MJ (Eds.), as cited in Mackenbach and Stronks):

“No single country has the capacity to contribute more than a fraction of the knowledge necessary to support strategies for reducing inequalities in health. This is a matter not only of insufficient resources for research but also of restricted opportunities for implementing—and then evaluating—policies and interventions. International exchange, and perhaps coordination, is therefore necessary. There is an important role for international agencies such as the European Union to support such Collaboration.” (p. 1031)

One suggested international collaboration might be sharing the workload of reviewing PPH interventions of effectiveness (i.e., “Evidence Reviews”) with the US Task Force on Community Preventive Services, especially those interventions that have particular or unique relevance to Canada.

Third, interviewees expressed concern that new structures not duplicate what others already do, and that any additional efforts at least collaborate with and enhance existing structures. One such example is the Cochrane Database of Systematic Reviews (CDSR), which is a searchable database of Cochrane Collaboration reviews. However, at least four limitations to its use are evident. First, it contains only reviews that have been performed under the auspices of the Cochrane Collaboration, using its methodology. Second, currently, only subscribers can access the full text of reviews, although some interviewees suggested that Canada should purchase a national subscription. Third, the reviews are not appraised for relevance to a Canadian context. Fourth, it is unlikely that many potential PPH users would be able to utilize the technically sophisticated Cochrane library and websites without specific training. Other searchable databases exist (e.g., the Database of Reviews of Effectiveness, and the National Health Service Centre for Reviews and Dissemination), but these may be subject to some of the same criticisms as the CDSR. The suitability of existing databases, and plans to link with or extend the work of these databases, must be explored more fully. Furthermore, this type of database is a passive source of dissemination, and effective KEU requires the additional inclusion of more active strategies. Another example is to partner with the Canadian Cochrane Network to identify researchers who would be interested in doing certain SRs, and to facilitate training of new researchers to conduct SRs.

Relatively unique functions of a new Canadian PPH Evidence Centre and Research Network could include:

- raising awareness about the sources of PPH research evidence and, particularly, SRs and synthesis research,
- leading the creation of a national PPH research agenda,
- maintaining a registry of ongoing research projects in PPH,
- appraising existing research evidence,
- functioning as a repository of KEU strategies with proven effectiveness, and
- evaluating KEU efforts.

Fourth, interviewees expressed a desire for access to expertise and a bank of knowledge about effective dissemination methods. Several Canadian research units are investigating effective KEU practices, including those relevant to PPH environments, and a Canadian Evidence Centre and Research Network would be well positioned to partner with these researchers. In addition, a structure(s) that interacts with both research users and producers could help to create linkages between these groups, to improve dissemination and access to target audiences. Interviewees felt that a strong “web base” would be crucial to successful KEU, and that any interface must be interactive, to allow for different users, needs, contexts and applications of PPH research evidence. A need to understand and respond to “user-pull” factors was acknowledged. Finally, an Evidence Centre and Research Network could conduct their own research and evaluation of KEU in the Canadian environment.

Fifth, the activities of an Evidence Centre and Research Network require significant financial and human resources, including an adequately-funded infrastructure to oversee and manage the processes. This infrastructure should include funded positions for professional and support staff for both the Centre and the Network. Interviewees felt strongly that funding must be collaborative, as the services and outcomes are beneficial to all parties. Some interviewees also stressed that the process of continually applying for research grants (versus endowed research funds) is time-consuming and inefficient, and hampers the proposal of both urgent and long-term research projects; hence funders should support long-term research programs rather than short-term projects. This suggests that the Centre and Network should receive long-term core funding from a mix of governmental sources at various levels (federal, provincial, territorial, regional, local), supplemented by academic and voluntary sector contributions. Finally, interviewees felt that the structures should be closely tied to, and perhaps even administered from organizations that are credible to both research users and producers.

The above five considerations, distilled from interviews with research producers and corroborated by literature in the field, much of it based on the opinion and experience of Canadian public health practitioners, is a starting point for recommendations and further discussion.

**RECOMMENDATIONS**

The development of new structures to assist the production, dissemination and uptake of relevant, high-quality PPH research evidence and its implementation into PPH policy and programs faces numerous challenges, many of which have been described here (e.g., coordination of efforts among diverse stakeholders, across Canada and internationally; quality assurance and consistency of research; methodological development; effective knowledge dissemination to users; incorporation of research evidence into practice; rigorous yet feasible evaluation of functions; and sustainable funding). The themes of these interviews are echoed in other consultations of PPH stakeholders, which called for the:

- creation of linkages between researchers and users,
- involvement of policy-makers in knowledge generation and exchange,
• agreement about appropriate research methodologies and standards of evidence,
• integration and increased linkages between databases of research evidence,
• active encouragement and stimulation of KEU,
• elimination of regional disparities in research and KEU, and
• improvement of research and KEU collaboration between regions and organizations.

Dr. Kevin Keough, former Chief Scientist with Health Canada, contends that “Good governance requires scientists with the ability and credentials to generate and translate scientific findings into sound science advice” (ref. 29, p.106). He encourages decision-makers to “fund work in universities, contract to industry and increasingly access knowledge generated in research institutes in Canada and abroad”, and to “find new ways to partner ...(among) multi-disciplinary teams of scientists from across the innovation system” (p. 106). The establishment of a Canadian PPH Evidence Centre and Research Network would foster new and important ways for the PPH community to partner, with the ultimate goal of generating and promoting the uptake of research evidence in a coordinated manner.

The next step in furthering these efforts is to bring the ideas laid out here to a wider audience for consideration and discussion, including relevant local, provincial/territorial and national agencies, particularly those involved in the design of the new Public Health Agency of Canada and National Collaborating Centres for Public Health, whose mandates include a knowledge exchange and uptake function. Now is the time to create and coordinate mechanisms to optimize evidence-based decision-making in Canadian population and public health.

---

**Glossary and Acronyms**

**Dissemination** – an active and strategically planned process whereby new or existing knowledge, interventions or practices are spread.

**Evidence-based Decision-making** – the conscientious, explicit and astute use of the best-available evidence from relevant research fields to inform practice and policy decisions regarding health care, health systems, and population and public health programs. The evidence on which decisions are made should be systematically collected, reviewed for quality and relevance, and synthesized.

**Knowledge Exchange** – the interactive and iterative process of imparting meaningful knowledge between research users and producers, such that research users receive information that they perceive as relevant to them and in easily usable formats, and producers receive information about the research needs of the users.

**Knowledge Management** – the creation and subsequent management of an environment which encourages knowledge to be created, shared, learned, enhanced and organized.

**Knowledge Transfer** – the imparting of research knowledge from producers to potential users. It has a connotation of uni-directionality in comparison with a more bi-directional "knowledge exchange".

**Knowledge Translation** – an encompassing term that denotes the exchange, synthesis and ethically-sound application of research findings within a complex system of relationships among researchers and knowledge users; the incorporation of research knowledge into policies and practice, thus translating knowledge into improved health of the population.

**Knowledge Uptake** – the acquisition and review of research knowledge and its utilization, including incorporation into decision-making.

**Meta-analysis** – the quantitative mathematical aggregation of data and research findings from independent studies to yield a more statistically powerful, integrated result.

**Network** – a group of autonomous organizations that come together to achieve goals that none of them can attain on their own. These conditions include the growing complexity of key problems or issues and the increasing interdependence among organizations and institutions in a changing environment. The development of a network is a form of response to this complexity and interdependence.

**Population Health** – the broad trans-disciplinary approach to understanding the fundamental determinants of human health and development at the individual level and in whole societies. These determinants include the complex lifelong interactions between socio-economic, physical and genetic environments, at both individual and collective levels.

**Public Health** – the combination of sciences, skills and beliefs that is directed to the protection and promotion of health of a population.

**Public Health Services System** – the governmental organizations (municipal, regional, provincial, territorial and federal) and resultant programs and services of disease prevention (and in some cases treatment), health protection, health promotion, and disease surveillance provided to a population.

**Research** – the organized and purposeful collection, analysis and interpretation of data with the goal of exploring an issue or investigating a particular question. Research designs include descriptive, observational, comparative and experimental models. It may involve the primary collection of new data, or the analysis or synthesis of existing data and research findings. The focus may be on individuals or communities. Types of research...
particularly relevant in the context of population and public health include descriptive studies of health status, etiologic and epidemiologic studies, and evaluation of the delivery and effectiveness of public health programs.

Research Producer – persons and institutions who conduct research or perform synthesis research in the areas of population and public health (e.g., scientists at a university, independent institute, or government-affiliated research units) (see also Table I).

Research User – decision-makers, policy-makers, planners, and practitioners who might use research evidence to inform the development or maintenance of population and public health programs and policy (e.g., senior managers/directors at local, provincial/territorial and federal public health agencies) (see also Table I).

Systematic Review (SR) – a research methodology that pulls together, pools, and synthesizes the best available existing evidence. Its strength lies in the unbiased and explicit search for and collection of relevant literature, and the extraction of and analysis of pre-defined relevant data. It is sometimes termed "systematic overview". It is in contrast to traditional "review," which aims to appraise, integrate and summarize a collection of literature of the author's choosing, and does not necessarily incorporate a thorough, unbiased search for relevant literature.

Synthesis Research – A methodological approach to research which aims to systematically collect, evaluate and integrate research evidence on a defined topic. The synthesis may be purely narrative (e.g., description and appraisal of relevant studies) or may involve pooling of quantitative data.

<table>
<thead>
<tr>
<th>ACRONYMS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AHFMR</td>
<td>Alberta Heritage Fund for Medical Research</td>
</tr>
<tr>
<td>CDSR</td>
<td>Cochrane Database of Systematic Reviews</td>
</tr>
<tr>
<td>CHSRF</td>
<td>Canadian Health Services Research Foundation</td>
</tr>
<tr>
<td>CIHI</td>
<td>Canadian Institute for Health Information</td>
</tr>
<tr>
<td>CIHR</td>
<td>Canadian Institutes of Health Research</td>
</tr>
<tr>
<td>CPHI</td>
<td>Canadian Population Health Initiative, Canadian Institute for Health Information</td>
</tr>
<tr>
<td>EBDM</td>
<td>Evidence-based decision-making</td>
</tr>
<tr>
<td>EPHPP</td>
<td>Effective Public Health Practice and Policy</td>
</tr>
<tr>
<td>EPPI-Centre</td>
<td>UK Evidence in Practice and Policy Information Centre</td>
</tr>
<tr>
<td>ESRC</td>
<td>UK Economic and Social Research Council</td>
</tr>
<tr>
<td>HDA</td>
<td>Health Development Agency, UK National Health Service</td>
</tr>
<tr>
<td>IPH</td>
<td>Institute for Population Health, University of Ottawa</td>
</tr>
<tr>
<td>ICES</td>
<td>Institute for Clinical Evaluative Studies</td>
</tr>
<tr>
<td>IPPH</td>
<td>Institute for Population and Public Health, Canadian Institutes of Health Research</td>
</tr>
<tr>
<td>IWH</td>
<td>Institute for Work and Health</td>
</tr>
<tr>
<td>KEU</td>
<td>Knowledge exchange and uptake</td>
</tr>
<tr>
<td>KT</td>
<td>Knowledge translation</td>
</tr>
<tr>
<td>PHAC</td>
<td>Public Health Agency of Canada</td>
</tr>
<tr>
<td>PHRED</td>
<td>Public Health Research, Education, and Development Program</td>
</tr>
<tr>
<td>PPH</td>
<td>Population and public health</td>
</tr>
<tr>
<td>SEARCH</td>
<td>Swift Efficient Application of Research in Community Health, Alberta Heritage Fund for Medical Research</td>
</tr>
<tr>
<td>SR</td>
<td>Systematic review</td>
</tr>
</tbody>
</table>
APPENDIX 1

Canadian Institutes of Health Research Knowledge Translation Framework (June 2002)

The Framework

CIHR’s approach to knowledge translation (KT) is based on the belief that the flow of health knowledge into beneficial actions can be accelerated by ensuring that the translation of knowledge is an integral part of the entire research cycle. This is illustrated in Figure 1 below.

Figure 1. Integrating Knowledge Translation into the Research Cycle

Recognizing the potential health benefits of integrating KT into the research cycle, John Lavis has commented that “[researchers (and research funders) should create more opportunities for interactions with the potential users of their research. They should consider such activities as part of the ‘real’ world of research, not a superfluous add-on.”

As shown in Figure 1, the exchange of knowledge between researchers and the potential users of research findings is particularly beneficial at the following stages of research:

- KT1: Defining research questions and methodologies;
- KT2: Conducting research (as in the case of participatory research);
- KT3: Contextualizing research findings against the background of other knowledge and socio-cultural norms;
- KT4: Publishing research findings in plain language and accessible formats;
- KT5: Applying knowledge (for example, in decision-making and developing health protocols); and
- KT6: Influencing subsequent rounds of research based on the impacts of knowledge use.

To be effective and consistent with CIHR’s approach, strategies for KT should be tailored to meet three dimensions: the unique needs associated with translating knowledge at each stage of the research cycle (KT1 through KT6, as above), the different types of health knowledge to be translated, and the particular uses of health knowledge, as shown in Figure 2.

Figure 2. The Three Dimensions of CIHR’s Strategies for Health-related Knowledge Transfer

The types of health knowledge to be translated, as outlined in the CIHR Act (www.cihr-irsc.gc.ca/e/22948.html), are biomedical research; clinical research; research on health services and systems; and research on populations, including the social, cultural and environmental influences on health (CIHR’s four pillars of health research). To date, little work has been done to understand how the characteristics of research in the four pillars influence the design of effective KT strategies. This is especially true for KT processes for contextualizing knowledge that is created from research in different pillars (see KT3). The need to understand the implications of the different characteristics of the four research pillars for KT is underscored by the growing trend to health research that crosses several research pillars, and by CIHR’s mandate to encourage interdisciplinary and integrated research.

For the purposes of this Framework, the uses of health knowledge have been grouped into the following five categories:

1. Research within and across all research disciplines, contributing to knowledge about health;
2. Policy-making, planning and administration across all portfolios of public policy and throughout the health care system;
3. Health care provision, in both the formal and informal systems of care;
4. Maintenance and improvement of personal health, including actions intended to influence or represent the views of individual Canadians through, for example:
   - Voluntarism
   - Education
   - Communications
   - Advocacy
5. Commercialization by, for example, venture capital firms, pharmaceutical and medical device manufacturers, biotechnology companies, medical service sector, retailers and distributors.
# APPENDIX 2

## List of Interviewees (2002)

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Canada</strong></td>
<td></td>
</tr>
<tr>
<td>Elizabeth Dickson</td>
<td>Director, Knowledge Translation and Dissemination, CIHR</td>
</tr>
<tr>
<td>Vivek Goel</td>
<td>HEALNet</td>
</tr>
<tr>
<td>John Feightner</td>
<td>Chair, Canadian Task Force on Preventive Health Care</td>
</tr>
<tr>
<td>Jane Bartram</td>
<td>Director, Research Transfer, Institute for Work and Health</td>
</tr>
<tr>
<td>Arminée Kazanjian</td>
<td>Principal Investigator, British Columbia Health &amp; Technology Assessment Unit</td>
</tr>
<tr>
<td>John Lavis</td>
<td>Centre for Health Economics and Policy Analysis, McMaster University</td>
</tr>
<tr>
<td>Jeremy Grimshaw</td>
<td>Institute of Population Health, University of Ottawa; Cochrane Effective Practice &amp; Organization of Care Review Group</td>
</tr>
<tr>
<td>James Frankish</td>
<td>Institute of Health Promotion Research, University of British Columbia</td>
</tr>
<tr>
<td>Steve Manske</td>
<td>Centre for Applied Research, University of Waterloo</td>
</tr>
<tr>
<td>Jean-Louis Denis</td>
<td>Chair, Governance and Transformation, Université de Montreal</td>
</tr>
<tr>
<td>Helen Thomas</td>
<td>Effective Public Health Practice and Policy, McMaster University</td>
</tr>
<tr>
<td>Maureen Dobbins</td>
<td>Registry of Effectiveness Evidence for Population and Public Health, McMaster University</td>
</tr>
<tr>
<td>Jonathan Lomas</td>
<td>Chief Executive Officer, Canadian Health Services Research Foundation (CHSRF)</td>
</tr>
<tr>
<td>Louise Lapierre</td>
<td>Senior Program Officer, Primary Healthcare, CHSRF</td>
</tr>
<tr>
<td>Sara Hayward</td>
<td>Alberta Heritage Fund for Medical Research (AHFMR), Swift Efficient Application of Research in Community Health</td>
</tr>
<tr>
<td>Christa Harstall</td>
<td>(SEARCH) Program; Health Technology and Assessment Program</td>
</tr>
<tr>
<td>Terry Klassen</td>
<td>AHFMR, Cochrane Collaboration Child Health Field</td>
</tr>
<tr>
<td>Kathie Clark</td>
<td>Canadian Cochrane Network and Centre</td>
</tr>
<tr>
<td>Bernard Duval</td>
<td>Direction de la protection de la sante publique du Ministere de la Sante et des Services sociaux du Quebec</td>
</tr>
<tr>
<td>Hanita Tiefenbach</td>
<td>Acting Director, Research Unit, Corporate Policy Branch, Ontario Ministry of Health &amp; Long-Term Care (OMH&amp;LTC)</td>
</tr>
<tr>
<td>Sean Keelor</td>
<td>Research Transfer Advisor, Corporate Policy Branch, OMH&amp;LTC</td>
</tr>
<tr>
<td>Helen Brown</td>
<td>Acting Manager, Population Health Services, Public Health Branch, OMH&amp;LTC</td>
</tr>
<tr>
<td>Clarence Clottey</td>
<td>Director, Evidence &amp; Information for Chronic Disease, Policy Division, Centre for Chronic Disease Prevention &amp; Control, Health Canada</td>
</tr>
<tr>
<td>Geoffrey Gurd</td>
<td>Acting Director, Research Management &amp; Dissemination Division, Health Canada</td>
</tr>
<tr>
<td><strong>United States</strong></td>
<td></td>
</tr>
<tr>
<td>Shawna Mercer</td>
<td>Extramural Research Program, United States Centers for Disease Control and Prevention (CDC)</td>
</tr>
<tr>
<td>Stephanie Zaza</td>
<td>Chief, Community Guide Branch; Chair of Task Force on Community Preventive Services, CDC</td>
</tr>
<tr>
<td>Peter Briss</td>
<td>Chief, Systematic Reviews Section, Community Guide Branch, CDC</td>
</tr>
<tr>
<td>Jon Kerner</td>
<td>National Cancer Institute, United States National Institute of Health</td>
</tr>
<tr>
<td>Robert Graham</td>
<td>Director, Centre for Practice &amp; Technology Assessment, Agency for Health Quality Research</td>
</tr>
<tr>
<td><strong>United Kingdom</strong></td>
<td></td>
</tr>
<tr>
<td>Don Nutbeam</td>
<td>Director, Public Health Division, UK Department of Health</td>
</tr>
<tr>
<td>Ginny Brunton</td>
<td>Institute of Education and Social Science Research Unit, Evidence for Policy &amp; Practice Coordinating Centre (EPPI-Centre); Cochrane Collaboration Health Promotion &amp; Public Health Field</td>
</tr>
<tr>
<td>Mike Kelly</td>
<td>Director, Research and Information, Evidence Base Initiative, National Health Services Health Development Agency (NHS-HDA)</td>
</tr>
<tr>
<td>Jos Kleijnen</td>
<td>Director, National Health Services Centre for Reviews &amp; Dissemination (NHS-CRD)</td>
</tr>
<tr>
<td>Peter Littlejohns</td>
<td>Clinical Director, UK National Institute for Clinical Excellence (NICE)</td>
</tr>
<tr>
<td>Richard Heller</td>
<td>Evidence for Population Health Unit, University of Manchester</td>
</tr>
<tr>
<td>Annette Boaz</td>
<td>Senior Research Fellow, UK Centre for Evidence-Based Policy and Practice, University of London</td>
</tr>
<tr>
<td>Mark Petticrew</td>
<td>Centre for Evidence-Based Public Health Policy, University of Glasgow</td>
</tr>
</tbody>
</table>
REFERENCES

37. Rothwell PM. External validity of randomised controlled trials: “To whom do the results of this trial apply?” Lancet 2005;365(9453):82-93.
58. Canadian Heart Health Dissemination Project. Canadian Heart Health Dissemination Research. *Int J Health Promotion and Education* 2001;Supplement 1:Inclusive.